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STRUCTURE OF THE BASE OF THE MISSISSIPPIAN BEECH CREEK (BARLOW) LIMESTONE IN ILLINOIS

Hubert M. Bristol

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HUBERT M. BRISTOL

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STRUCTURE OF THE BASE OF THE MISSISSIPPIAN BEECH CREEK (BARLOW) LIMESTONE IN ILLINOIS

HUBERT M. BRISTOL

ABSTRACT

The lower part of the Chesterian (Upper Mississippian) and the upper part of the Valmeyeran (Middle Mississippian) include the most prolific oil reservoirs in Illinois.

A structure map (herein published for the first time) on the base of the Beech Creek (Barlow) Limestone is most suitable for showing the structural configuration of these strata in the major oil producing portion of Illinois.

Five variations in the appearance of the Beech Creek are illustrated on electric logs: "single-kick," "depressed," "blunted," "thin," and "dangling base."

In addition to the structure map, on a scale of 1 inch equals 5.6 miles, the report includes a list of ozalid maps (on a scale of 2 inches to the mile), which may be obtained from the Illinois State Geological Survey, showing data but no structural contours.

INTRODUCTION

The lower part of the Chesterian (Upper Mississippian) and the upper part of the Valmeyeran (Middle Mississippian) include the most prolific oil reservoirs in Illinois. The structure of this part of the geologic column (fig. 1) is, therefore, of particular interest to the oil and gas industry of the state. The base of the Beech Creek (Barlow) Limestone provides a horizon suitable for mapping the structure of these strata (pl. 1, in pocket).

The Beech Creek Limestone, at the base of the Golconda Group, underlies the Fraileys

Shale and overlies the Cypress Sandstone. The name Barlow Lime has been applied widely to the Beech Creek. This report on the structure of the Beech Creek (Barlow) provides information in a form most useful to geologists exploring for oil and gas.

The following maps, as of January 1, 1967, are available:

1. Subsurface structure map of the base of the Beech Creek (Barlow) Limestone in Illinois, scaled 1 inch equals 5.6 miles,

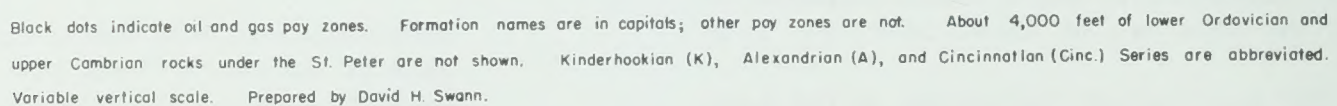


Figure 1 - Generalized geologic column of southern Illinois.

with 100-foot contours (pl. 1 of this report). To keep the regional map from being overcrowded, place names, oil pool names and outlines, and other features have been omitted. The scale permits an overlay of this map on the ozalid copies of the maps described in Illinois Petroleum 84, page 6, which show the productive area for each of 21 pay zones.

2. Maps of the base of the Beech Creek (Barlow) Limestone, scaled 2 inches to the mile, with datum points but no contours. These are modified Geological Survey Oil and Gas Development maps. Some are available for a limited time for a nominal charge in the form of blue-line prints (table 1 and fig. 2). Others, which have sparse well control, are on open file at the Illinois State Geological Survey.
3. Maps of the base of the Beech Creek (Barlow) Limestone, scaled 1 inch to the mile, with 20-foot contours but no datum points. Two of these are available, one covering Lawrence County and the other covering Crawford County. They may be obtained for a limited time in the form of blue-line prints at the Geological Survey.

Acknowledgments

The cooperation of Hugh Buehner of Marathon Oil Co., Robert Brownfield of Jet Oil Co., David Davison, Paul Farmer, and Francis Pierce, who checked data used in preparing these maps, is gratefully acknowledged.

THE BASE OF THE BEECH CREEK (BARLOW) AS A KEY HORIZON

Many horizons in the Mississippian are used for mapping structure in Illinois. Those commonly used by the oil industry include the base of

the Kinkaid Limestone, the top of the massive member (Scottsburg Member) of the Menard Limestone, the base of the Vienna Limestone, the base of the Renault Limestone, the top of the Ste. Genevieve Limestone, and the top and base of the Beech Creek (Barlow) Limestone. On a regional basis, each of these has some major drawback. The base of the Beech Creek (Barlow) Limestone was chosen for the following reasons:

1. The Beech Creek covers a large part of the oil-productive area of the state.
2. It is deep enough within the Chesterian section to be representative of the structure of the series.
3. It immediately overlies the Cypress Sandstone, the most productive unit in Illinois, and is only a short distance above other important producing zones.
4. It is generally easy to recognize on electric logs.
5. Many geologists are accustomed to using the Barlow as a structural horizon.

RECOGNITION OF THE BEECH CREEK (BARLOW) ON ELECTRIC LOGS

Recognizing the Beech Creek (Barlow) on electric logs is generally, but not always, easy. In order to clarify some of the difficulties, five variations in the appearance of the Barlow curves have been singled out.

These five variations, or types, are presented in figures 3 through 7.

Figure 3 indicates the most abundant and widespread type, which is also the one most easily recognized. For convenience it is here called the "single-kick" type.

Figure 4 shows a type that is quite common and is easily recognized; however, the base is difficult to pick consistently and is arbitrarily moved up or down a few feet by many geologists. This is here called the "dangling base" type. (The term "false Barlow" commonly used in the industry is a misnomer, as this is truly Barlow.)

A third or "thin" type, (fig. 5) is difficult to pick from a single log, but generally can be traced from well to well in an area.

The "blunted" type (fig. 6) is found where the limestone is more earthy or dolomitic.

The "depressed" type (fig. 7) is found beneath massive limestone and is difficult to identify. It should be confirmed by examination of samples where possible.

Other types of electric log curves occur that are not listed here. For example, the presence of sandstone directly beneath the Beech Creek can make its identification difficult. Figure 5, #2 Texaco #B-2 Hall, Hamilton County, is similar to this.

ACCURACY OF DATA

The datum points (base of the Beech Creek) on the ozalid prints are generally accurate to \pm

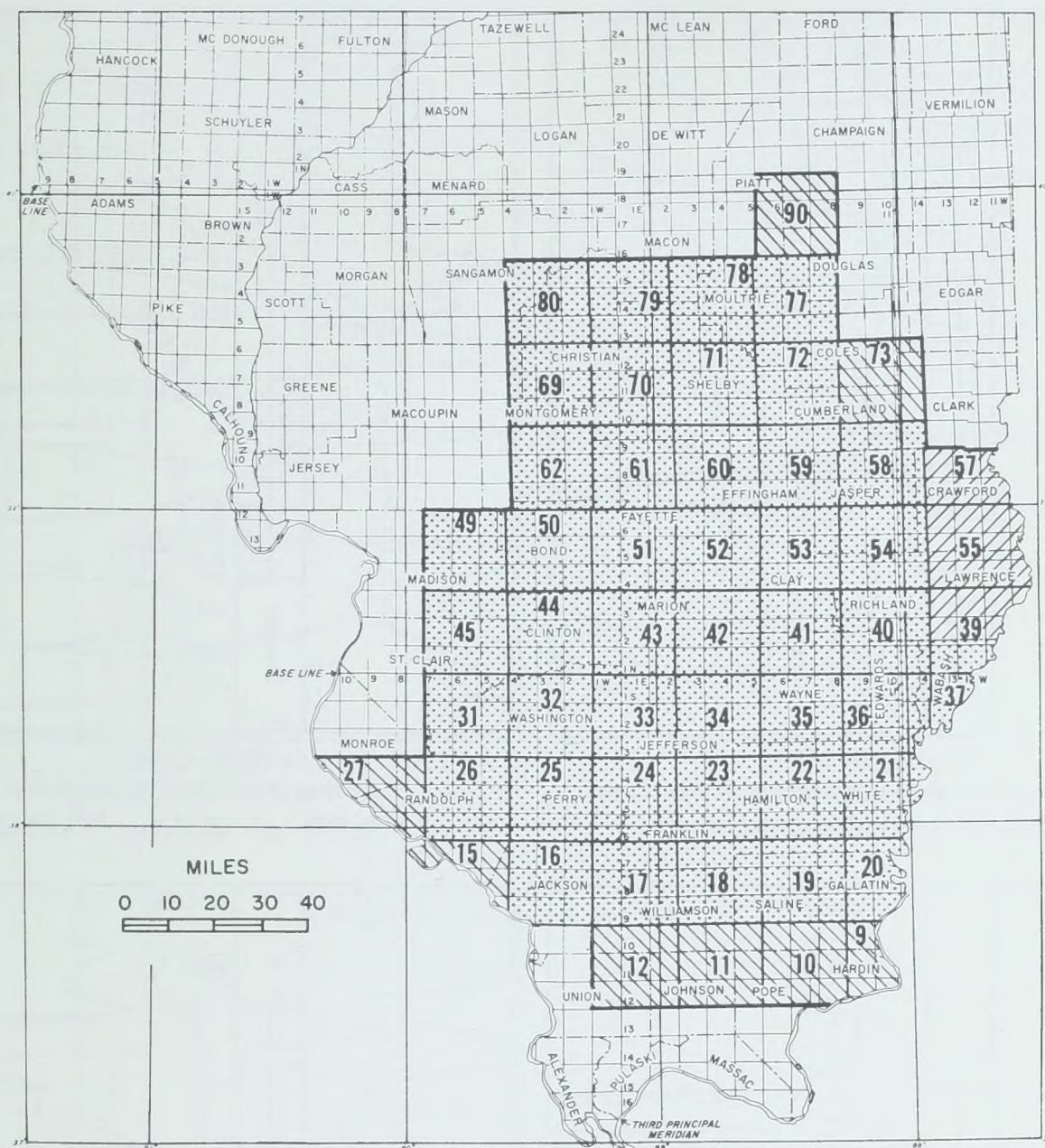
5 feet vertically. On the 2-inch to the mile maps, symbols indicate the source of the data. On these maps, a slash mark (/) at the upper left of the hole location indicates that the base of the Beech Creek was picked from the electric log. The symbol R indicates that the base was reported by a source such as a scouting service, driller's log, or other. The symbol S indicates that the base was picked by means of a sample study. The sample studies are usually those of the Illinois State Geological Survey, but some studies outside the Survey were used. Generally, the datum points determined by means of electric logs are more accurate than datum points determined by the other two methods. Some datum points also have an F besides the slash mark; this indicates "dangling" Beech Creek. The symbol \square on top of a hole indicates

TABLE 1 - BEECH CREEK (BARLOW) BASE MAP AREAS (SHOWN IN FIGURE 2)

A. Scale 2 inches to the mile, with datum points but no contours: ¹		
18 Thompsonville	36 Albion	53 Louisville
19 Eldorado	37 Mt. Carmel	54 Olney
20 Shawneetown	38-39 Allendale	58 Greenup
21 Carmi	(Wabash County only)	59 Effingham
22 McLeansboro	40 Noble	60 Beecher City
23 Benton	41 Clay City	61 Ramsey
24 DuQuoin	42 Xenia	62 Hillsboro
25 Pinkneyville	43 Centralia	69 Raymond
26 Sparta	44 Carlyle	70 Pana
31 Marissa	45 Lebanon	71 Shelbyville
32 Nashville	49 Worden	72 Mattoon
33 Roaches	50 Greenville	77 Arcola
34 Mt. Vernon	51 Patoka	78 Sullivan
35 Fairfield	52 Kinmundy	79 Moweaqua
		80 Taylorville
B. Scale 2 inches to the mile, with datum points but no contours: ²		
9 Cave in Rock	12 Goreville	17 Carbondale
10 Rosiclare	15 Chester	27 Renault
11 New Burnside	16 Murphysboro	73 Charleston
		90 Sadorus
C. Scale 1 inch to the mile, with 20-foot contours but no datum points: ¹		
Lawrence County		
Crawford County		

¹ Available in the form of blue-line copies for a limited time. Numbers preceding refer to locations on figure 2.

² On open file.



BEECH CREEK (BARLOW) BASE MAPS AVAILABLE




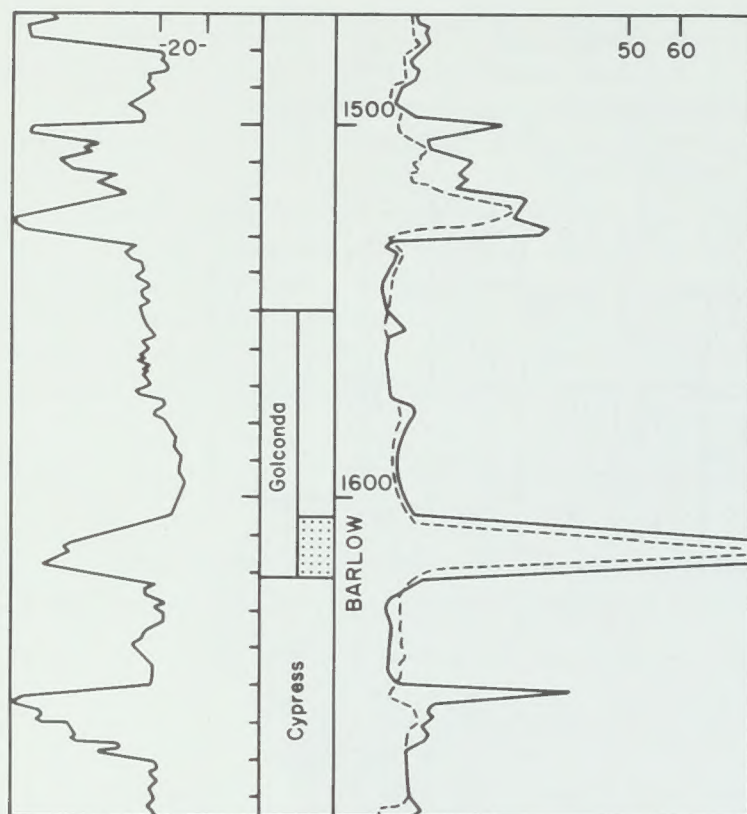
-  2 inches to the mile, with datum points but no contours
(Blue-line copies available for limited time)
-  2 inches to the mile, with datum points but no contours
(On open file)
-  1 inch to the mile, 20-foot contours, no datum points
(Blue-line copies available for limited time)
(Crawford and Lawrence Counties only)

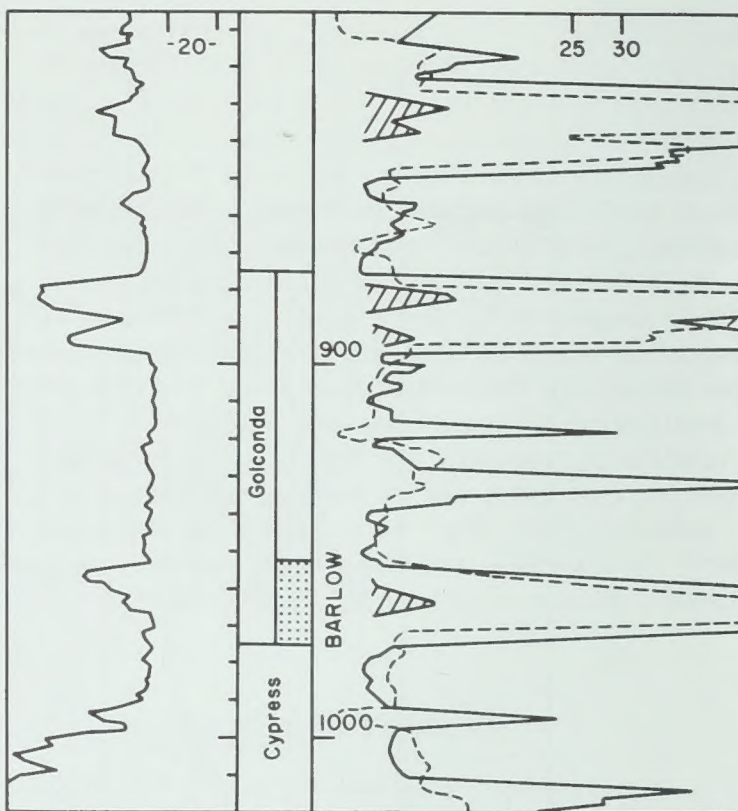
Figure 2 - Index map of Illinois for Beech Creek data.



COLES COUNTY

Zuhone and Pierce #1 - Whetsell and Whitley Comm.

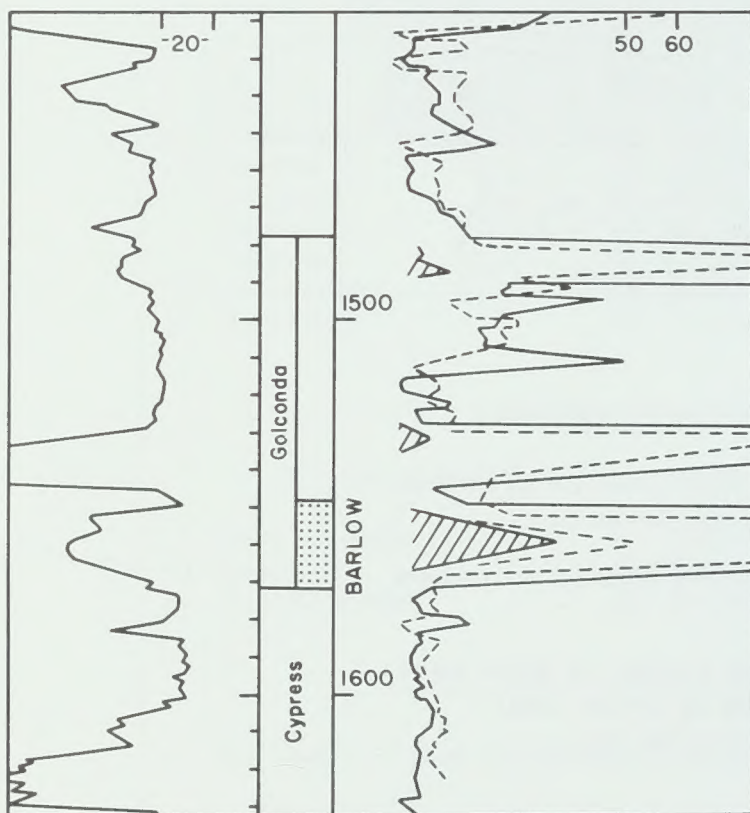
Elev. 659 10-13N-7E SW-NW-NW



CLINTON COUNTY

Robben #7 - Christian and Robben

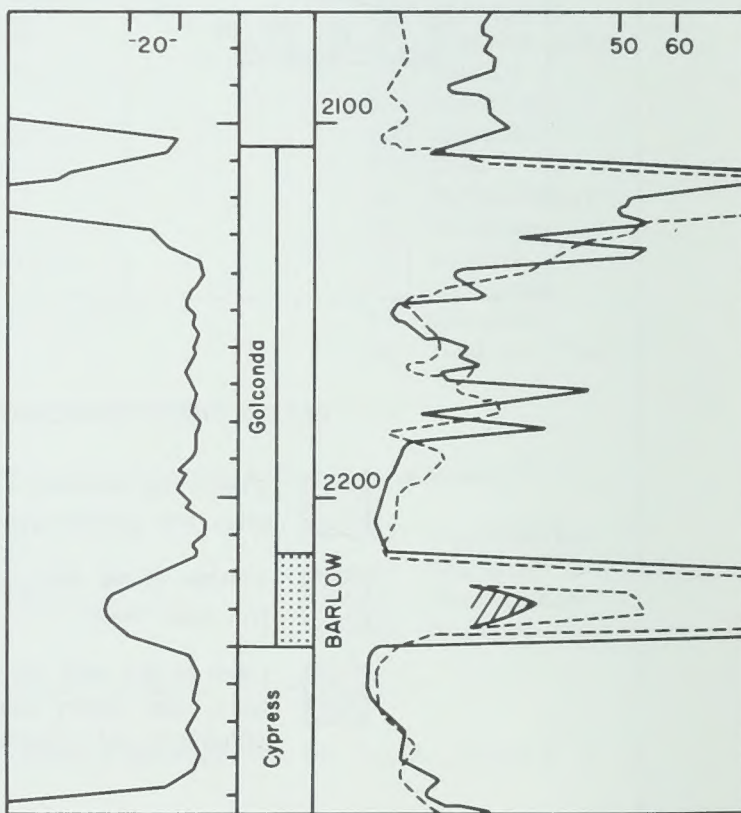
Elev. 484 5-1N-3W SW-SE-SE



LAWRENCE COUNTY

Johnson #28 - Buchanan

Elev. 465 16-3N-12W NE-SE-SE

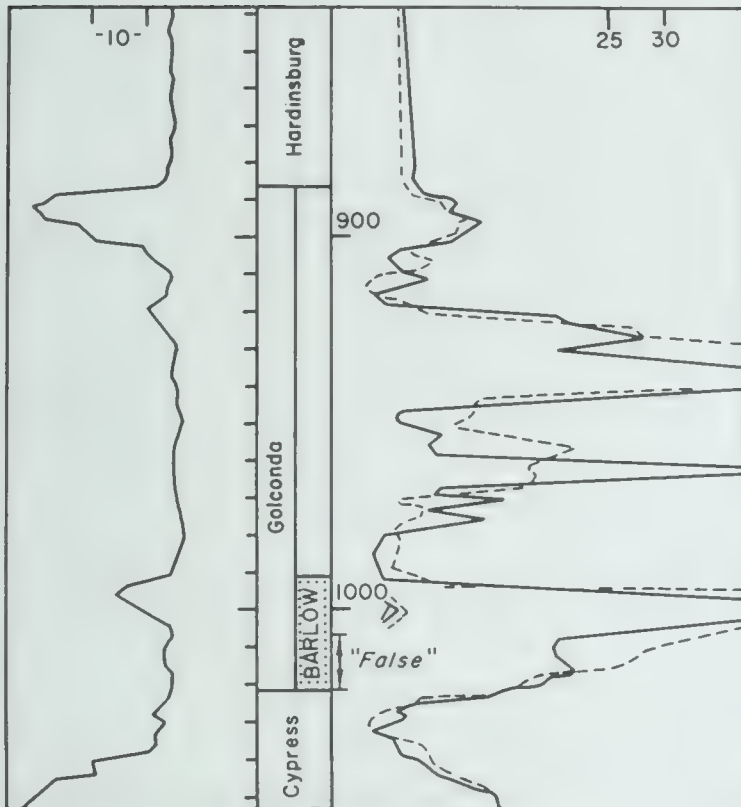


FRANKLIN COUNTY

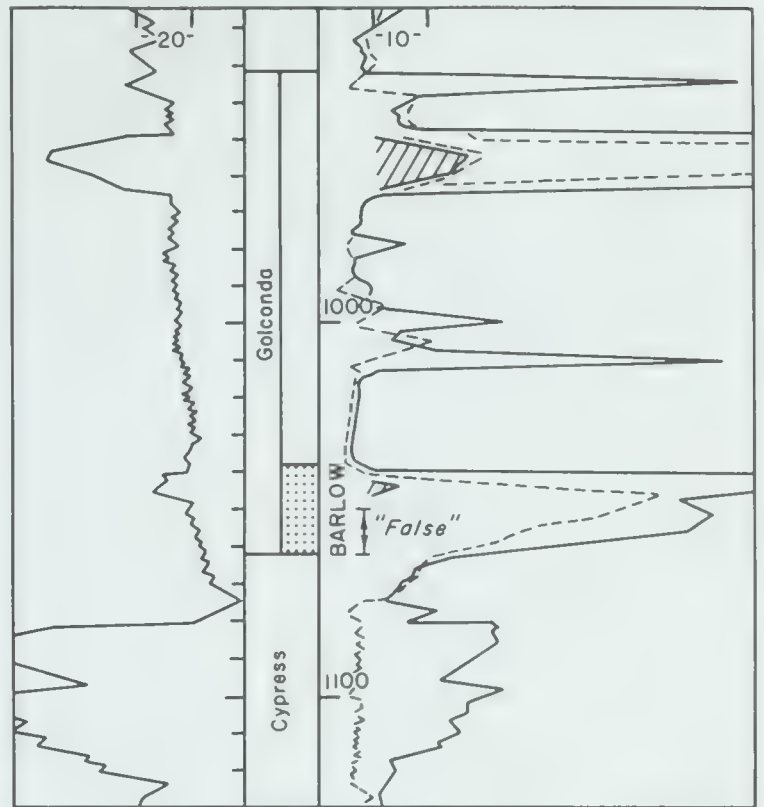
Bell and Zoller #2 - Zeigler Coal and Coke

Elev. 383 36-7S-1E SE-SW-NE

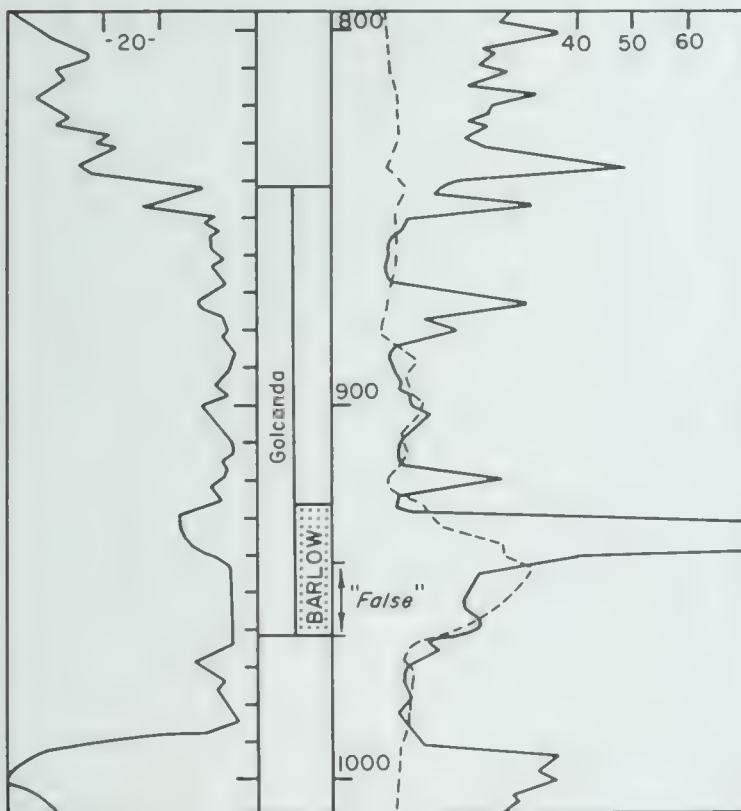
Figure 3 - Electric log characteristics of "single-kick" Beech Creek (Barlow).



CLINTON COUNTY
Boyd #2 - Schomaker
Elev. 470 2-2N-3W NE-SE-SE

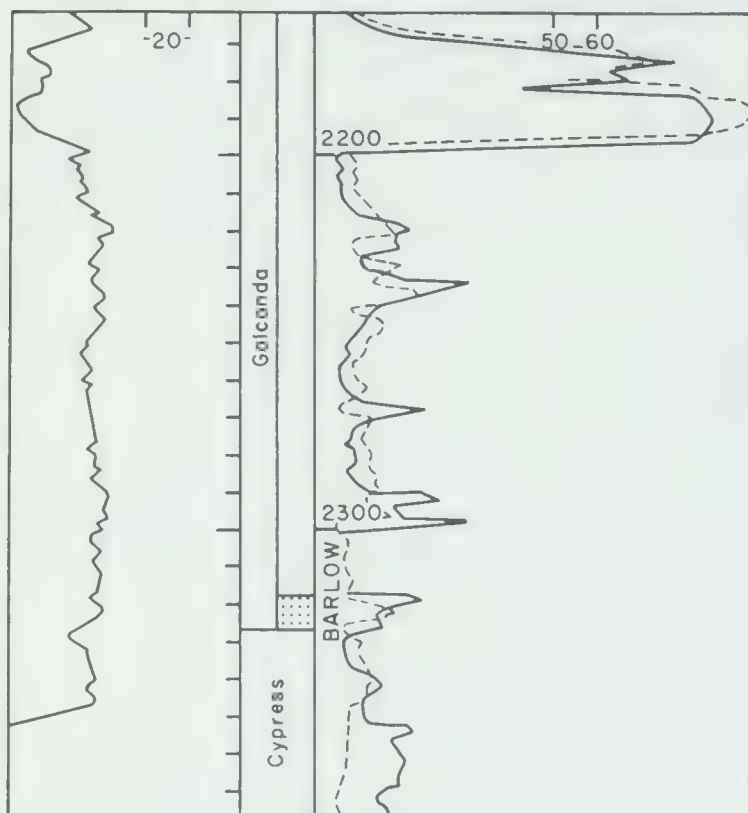


PERRY COUNTY
Rudy #1 - Baudison Cons.
Elev. 405 24-5S-3W SE-NE-SE

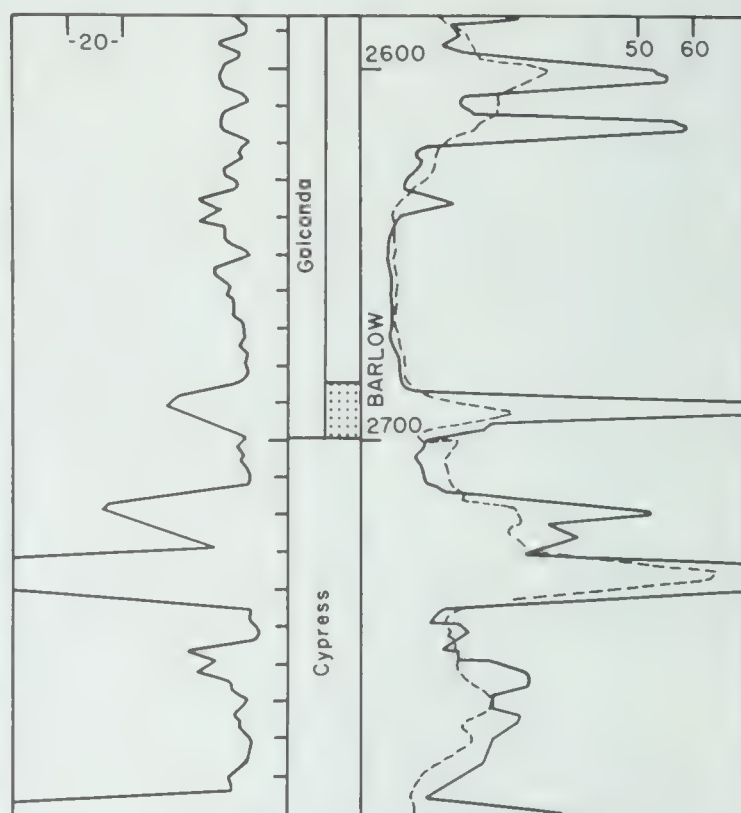


BOND COUNTY
Texas #1 - E. Enloe
Elev. 499 6-4N-2W SE-SE-NW

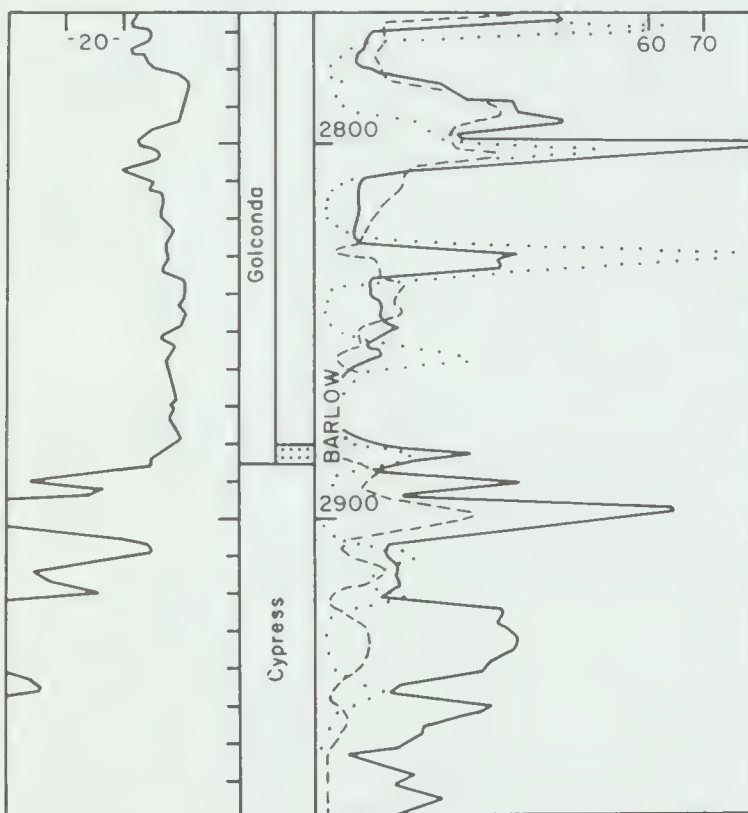
Figure 4 - Electric log characteristics of "dang-
ling base" or "false" Beech Creek (Barlow).



FRANKLIN COUNTY
Gallagher #2 - Zeigler
 Elev. 407 25-7S-1E NW-NE-NW

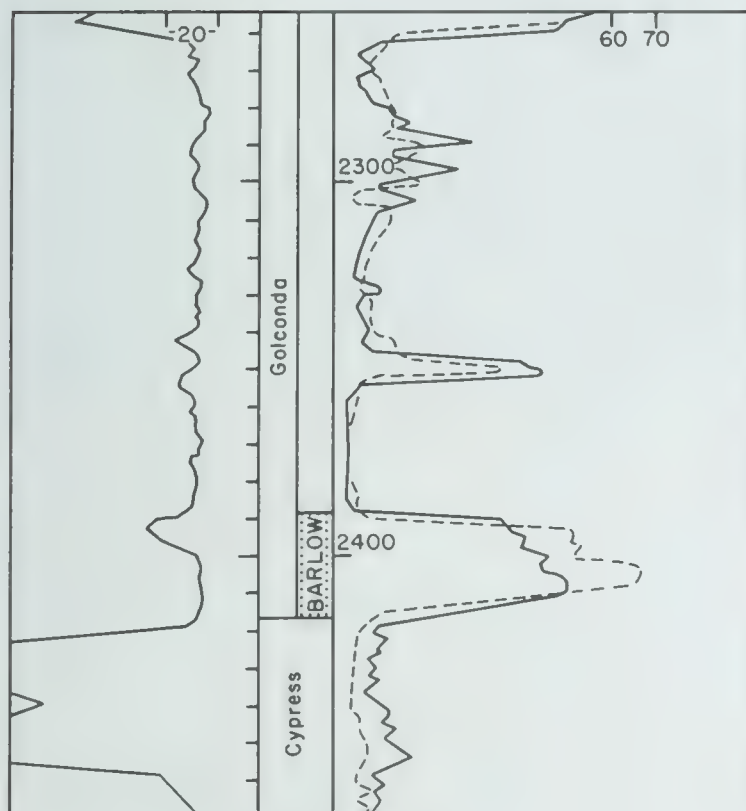


HAMILTON COUNTY
Texas Co. #B-2 - J.C. Hall
 Elev. 378 18-6S-7E NW-SE-NE

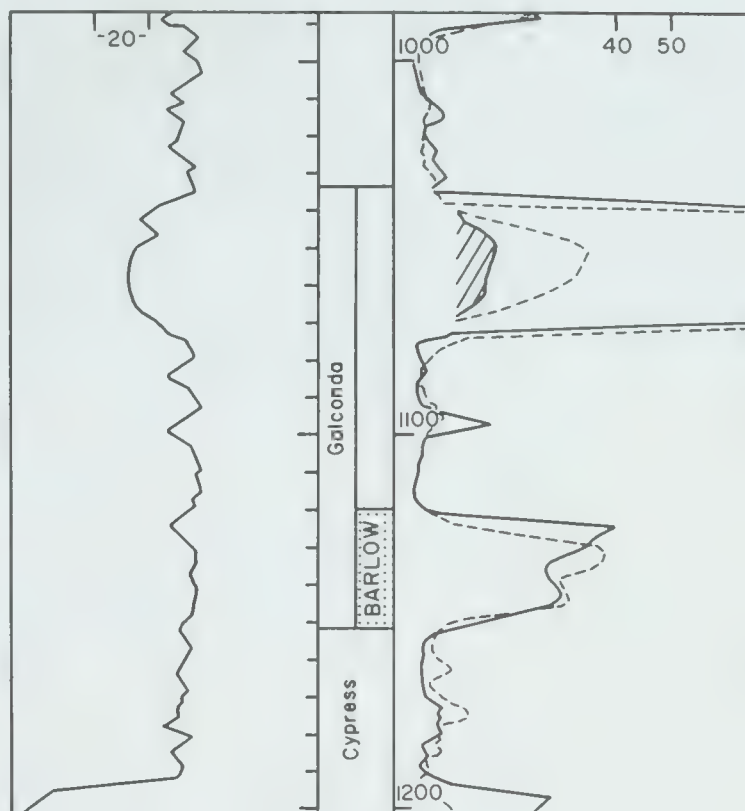


HAMILTON COUNTY
Everhart #1 - Wesley Found.
 Elev. 515 5-7S-5E SW-SW-SW

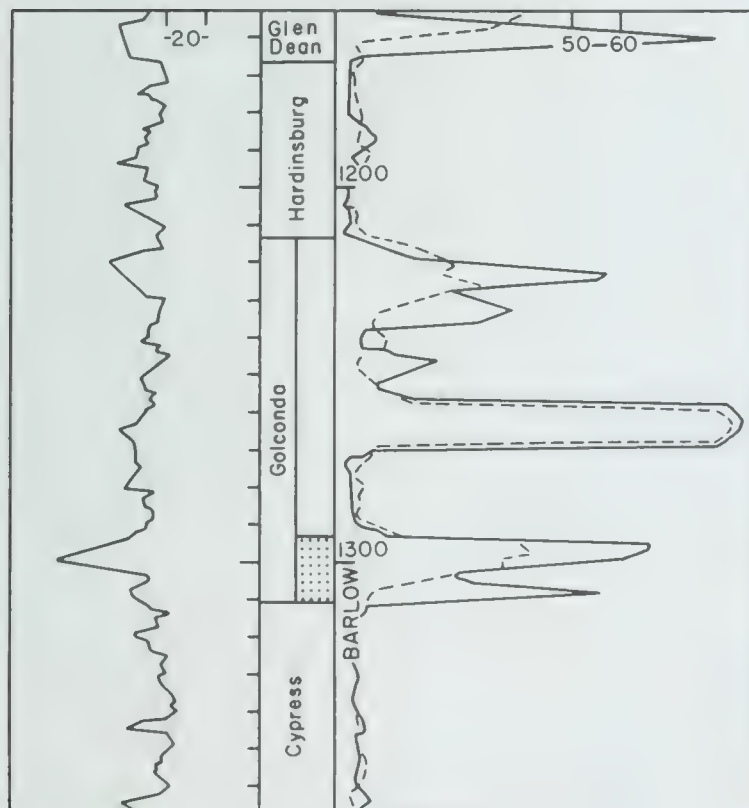
Figure 5 - Electric log characteristics of "thin" Beech Creek (Barlow).



FRANKLIN COUNTY
Gallagher #6-Zeigler
 Elev. 433 13-7S-1E NE-NW-SE

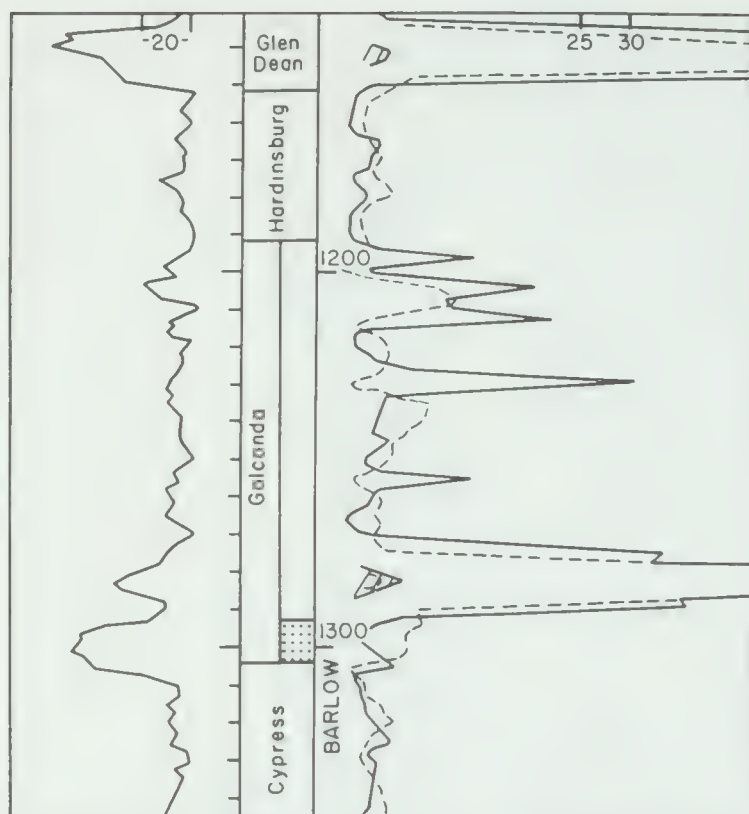


PERRY COUNTY
Mid-Continent Petr. Corp. #1-Glenn
 Elev. 493 9-4S-3W SW-SW-NE

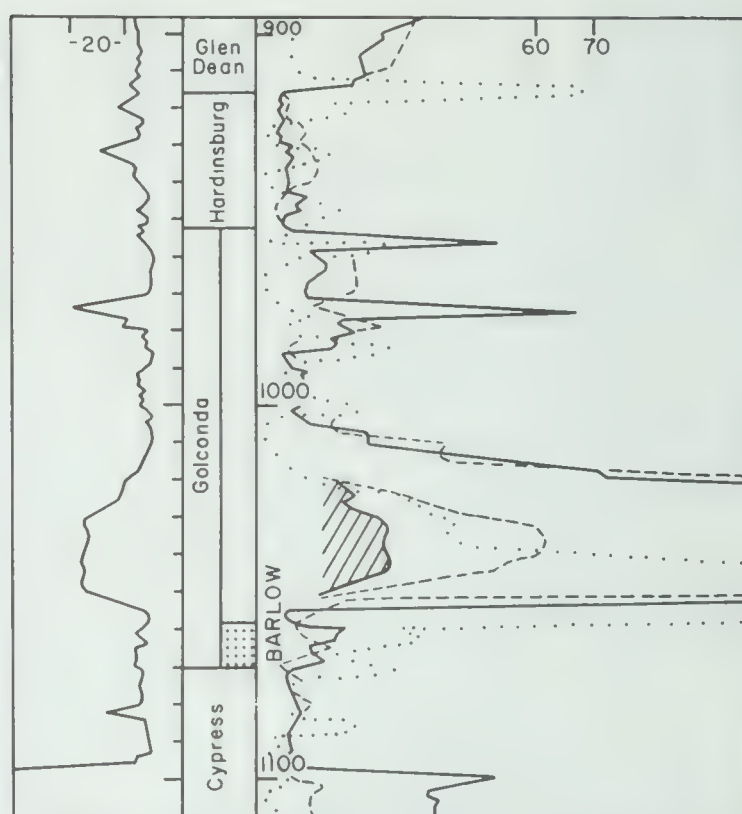


CLINTON COUNTY
Wm. J. Pfeffer #1-Atherton
 Elev. 475 22-1N-1W NE-SW-SW

Figure 6 - Electric log characteristics of "blunted" Beech Creek (Barlow).



WASHINGTON COUNTY
Homer Rutheford #B-5 - Cope
Elev. 460 34-1N-1W NE-SE-NE



RANDOLPH COUNTY
George and Wrather #1 - T. Fullerton
Elev. 562 14-4S-5W 990SL 1935WL NW-SE

Figure 7 - Electric log characteristics of "depressed" Beech Creek (Barlow).

that a fault has been noted in the well record. In some places, where many holes have been drilled, either the last two or three digits of the datum depth are given to avoid crowding.

FAULT DELINEATION

The accuracy with which the locations of faults can be determined is dependent on the amount of well control. Closely spaced well control in the Wabash Valley area permits accurate location of the faults in that vicinity. The Shawneetown and Rough Creek Faults are really zones

and not a single fault and can be located accurately in only a few areas. The faults in Perry County and the fault extending from T. 11 S., R. 3 E., T. 10 S., R. 6 E. are inferred because few holes have been drilled in those areas.

Abundant small-scale faulting of Pennsylvanian strata shown in coal mines and closely spaced coal test drilling along the Rough Creek Fault Zone and in outcrops of Pennsylvanian and Mississippian strata in the Pope-Hardin County complex suggests similar faulting of the Beech Creek (Barlow), although this is not shown on the plate because of lack of well control.

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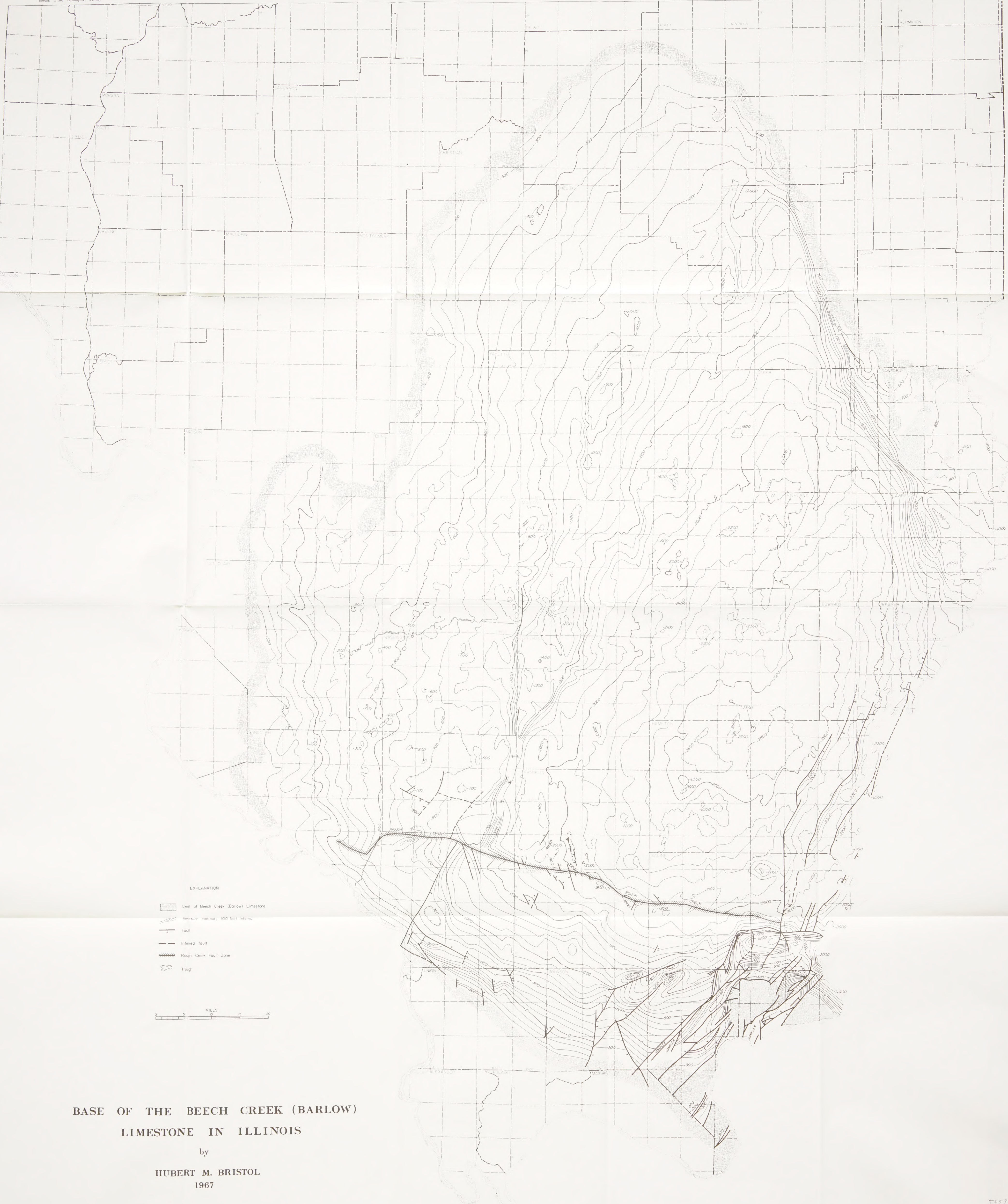
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